

PATENT COOPERATION TREATY

PCT

REC'D 31 MAR 2005



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference V80038WO		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)
International application No. PCT/CA 03/01992	International filing date (day/month/year) 17.12.2003	Priority date (day/month/year) 17.12.2002
International Patent Classification (IPC) or both national classification and IPC H01M8/12		
Applicant ALBERTA RESEARCH COUNCIL INC.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 8 sheets, including this cover sheet.
- ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
- These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:
- I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☒ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

Date of submission of the demand 08.07.2004	Date of completion of this report 30.03.2005
Name and mailing address of the International preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Gosselin, D Telephone No. +49 89 2399-8400 

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I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-21 as originally filed

Claims, Numbers

1-37 as originally filed

Drawings, Sheets

1/12-12/12 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).
(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees, the applicant has:
- ☐ restricted the claims.
 - ☒ paid additional fees.
 - ☐ paid additional fees under protest.
 - ☐ neither restricted nor paid additional fees.
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is
- ☐ complied with.
 - ☒ not complied with for the following reasons:
see separate sheet
4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:
- ☒ all parts.
 - ☐ the parts relating to claims Nos. .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-37
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-37
Industrial applicability (IA)	Yes: Claims	1-37
	No: Claims	

2. Citations and explanations

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see separate sheet

Re Item IV

Lack of unity of invention

1. The application lacks unity within the meaning of Rule 13.1 PCT.

The separate inventions or groups of inventions in the application are the following:

- a) the solid oxide fuel stacks of claims 1 to 17,
- b) the solid oxide fuel stack of claims 18 to 25, and
- c) the method of manufacturing a solid oxide fuel cell elements according to claims 26 to 37, said fuel cell elements being eventually usable in the solid oxide fuel stack of claims 18 to 25.

The three groups of inventions have only in common that their relative application field is the same and that they are concerned with the manufacture of "compact solid oxide fuel cell stack".

The examination authority considers that the technical problem consisting of manufacturing compact solid oxide fuel stack is known in the art, in particular for the provision of solid oxide fuel cells usable in portable appliances. The technical problem as defined in the application being not novel and/or inventive cannot form the common concept linking the different groups of inventions.

The first group of inventions comprises three embodiments (claims 1, 2 and 5), which have in common that "the fuel cells" are "extending in substantially the same direction and arranged in a cluster with at least one fuel cell having an electrolyte layer with a different composition and different maximum operating temperature than another fuel cell in the cluster, the fuel cell having the electrolyte layer with a higher maximum operating temperature being located closer to the core of the cluster than the fuel cell having the electrolyte layer with a lower maximum operating temperature." The embodiment of claim 1 lacking novelty, this feature is anticipated and the present group should formally have been further subdivided. However the search having been directed to the common feature, it is assumed that the search have been completed at the same time for the three embodiments of claims 1 to 17 and the search authority does not request additional search fees for the embodiments of claims 2 and 5.

The independent claims of the first and the second group of inventions have no

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features in common, which is not already known in the art. The common feature of the first group is not present in the stack of the second groups. The cells of the second groups are also not arranged in a concentric fashion (embodiments of claims 2 or 5). The electrolytes of the substacks of the second group of invention have not necessarily different compositions and different working temperatures.

The second and third groups of inventions have only in common that solid oxide fuel cell elements prepared by the methods of claims 26 to 32, and claims 33 to 37, are substacks involved in the structure of the solid fuel cell stack according to the claim 18. However, solid oxide fuel cell elements, as obtainable by the method of claim 33, are known in the art (c. D2). The substacks being not novel, it cannot be regarded as linked by a common concept.

Finally, the application only discloses the subject-matter of the different claims without giving evidence which could support an unexpected technical effect, benefits or the redefinition of an objective technical problem to be solved by one or several of the different individual embodiments as claimed in the independent claims.

Therefore the requisite unity of invention (Rule 13.1 PCT) does no longer exists inasmuch as a technical relationship involving one or more of the same or corresponding special technical features in the sense of Rule 13.2 PCT does not exist between the subject-matter of the above defined groups of invention. The three groups of inventions only provide independent solution which may be involved in solving a known technical problem (manufacturing of compact solid oxide fuel cells) and cannot be regarded as linked by a common concept. The present application proposes different independent alternatives for "compact solid oxide fuel cell stacks".

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

D1: US-B1-6 458 477 (HSU MICHAEL S) 1 October 2002 (2002-10-01)

D2: WO 01/71841 A (US ENERGY ; MICHAEL A COBB & COMPANY (US)) 27

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September 2001 (2001-09-27)

D3: WO 01/86030 A (ALBERTA RES COUNCIL ; SARKAR PARTHO (CA)) 15
November 2001 (2001-11-15)

D4: WO 03/001624 A (PALL CORP) 3 January 2003 (2003-01-03)

D5: EP-A-0 320 087 (WESTINGHOUSE ELECTRIC CORP) 14 June 1989
(1989-06-14)

2. The subject-matter of claim 1 (first group of invention) lacks novelty in view of the disclosure of D1. D1 essentially discloses the different embodiments by reference to assembly of planar fuel cell elements, however it is clear that the teaching, in particular of figures 3 and 4, applies also to tubular solid oxide fuel cell elements (column 7, lines 20-23). Even if the novelty was formally admitted, the embodiment of claim 1 of the application would not involve an inventive step.
3. The subject-matter of claims 2 to 17 is novel in view of the disclosure of D1. However, it is at present not possible to identify in the application documents evidence that the embodiments of independent claims 2 and 5 provide either an unexpected technical effect or solve an objective technical problem over the disclosure of D1, the subject-matter of claims 2 to 17 does not involve an inventive step over the disclosure of D1.
4. The subject-matter of claim 18 (second group of invention) differs from the disclosure of D2, in that the plurality of substacks is arranged side-by-side on a electrically conductive support plate. Apparently said support plates are introduced between the different layers of individual tubular cells in order to provide cohesion and rigidity of the individual layers and provide electrical connection between the outer electrodes of the individual tubular cells. This two functions are intrinsically provided by the structure of the planar sheets (44) of D2. It is at present not possible to identify in the application documents evidence that some of the features of the dependent claims should provide either an unexpected technical effect or solve an objective technical problem over the disclosure of D2, the subject-matter of claims 18 to 25 does not involve an inventive step over the disclosure of D2.
5. The method claims according to claims 26 to 37 (third group of invention) do not involve an inventive step in view of the disclosure of D2 and D3.
- 5a. The method of claim 33 differs from the method disclosed in D2 in that it specifies

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how the gas channels are prepared. The method of D1 is starting from already available tubes, which forms the inner electrodes.

- 5b. The preparation of single tubular solid oxide fuel cells involving the use of a combustible sacrificial core material is known from D3 (claims 17 to 21). D3 also teaches that this method is an alternative to the use of available tubes (claim 22).
- 5c. The introduction of features of D3 for the preparation of the inner tube (electrode) in the method of D2 is a slight constructional change which comes within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can be readily contemplated in advance. Consequently, the subject-matter of claims 33 to 37 appears to lack an inventive step in view of D2 and D3.
- 5d. The method of claim 26 to 32 differs essentially from the method of claims 33 to 37 in that the distance between the combustible core have been decreased. The application documents failed to show an unexpected effect or an objective technical problem, which could have been solved by the method of claims 26 to 32, therefore the subject-matter of claims 26 to 32 also appears to lack an inventive step in view of D2 and D3.
6. For the sake of completeness, the application refers to unpublished application documents. The international application numbers should be supplemented by the number of said applications as published.

Re Item VI

Certain documents cited

Certain published documents

Application No Patent No	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
WO 03 001624 A2	03.01.2003	21.06.2002	25.06.2001 10.12.2001